

Subj: PROPOSED INTERMEDIATE PASSENGER HELICOPTER AIRCREW BREATHING
DEVICE SYSTEM (IPHABDS)/EGRESS TRAINING STANDARDS FOR OVER
WATER FREQUENT FLYERS

Tab: (A) Draft Core Plus Individual Training Standard Task for
Egress from an Aircraft
(B) Draft Operating Force Intermediate Passenger Helicopter
Aircrew Breathing Device System (IPHABDS)/Egress Training
Employment Plan

1. The tabs outline the proposed training standards for just-in-time training of IPHABDS and Egress training for Marines designated by Commanders as frequent flyers over water. It is estimated that a deploying Marine Expeditionary Unit (MEU) has approximately 250 to 300 Marines who will require IPHABDS/Egress training prior to deployment. This number includes the Helicopterborne Company and members of the MEU's Command Element. The minimum water survival standards/qualification requirements and the primary and secondary training tracks are outlined in the following paragraphs.

a. Minimum Water Survival Standards/Qualifications. The following are the minimum standards/qualifications that must be achieved by each Marine or Sailor prior to participating in pre-deployment IPHABDS and Egress (Helicopter Dunker/SWET) training. Commanders shall ensure that unit personnel meet these standards/qualifications.

I) Qualified as a CWS4 (Combat Water Survival, Fourth Class).

II) Demonstrated Practical Application (Achieved no more than six months prior to participating in IPHABDS and Egress training).

* Two-minute tread water/drown proof

- Initially individuals wear utilities, boots, helmet, flack vest, and Load Bearing Equipment, but should ditch the combat equipment and retain their boots during the event.

* 25-yard swim.

- Wearing utilities and retaining boots.

* 15-yard underwater rope-pull.

- Wearing utilities and boots (This distance simulates the length of a helicopter's airframe).

b. Primary IPHABDS/Egress Training Track. The primary IPHABDS/Egress training track follows a building block approach and envisions utilizing the established training facilities (Helicopter Dunker) at the Navy's Aviation Physiology Branches at MCAS Cherry

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Point, NC, and Miramar, CA. Additionally, because of their instructional expertise in the utilization of compressed gasses, it is recommended the Navy Aviation Physiology Branches provide instruction on the IPHABDS device in conjunction with Egress training. This additional training requirement may require the Marine Corps to provide training support material in the form of IPHABDS bottles and system for filling the bottles. The training standards for IPHABDS and Egress are set forth in order of execution:

I) The unit leader in-charge of the Marines and Sailors arriving at the training facilities will provide written certification from the Unit Commander that all trainees have successfully achieved the prescribed minimum water survival standards/qualifications. All trainees will be dressed in the utility uniform and boots, and equipped with an LPU and IPHABDS for the entire training evolution.

II) IPHABDS and Egress Instruction and Practical Application (Aviation Physiology Branch).

- 1) In Processing.
- 2) Orientation Brief.
- 3) Instruction on the IPHABDS.
- 4) IPHABDS Practical Application.
 - a) Dry land breathing exercise.
 - b) Submerged breathing exercise. (Individual sits in the shallow end of the training tank (pool) and executes procedures for breathing compressed air from the IPHABDS).
 - c) 15-yard underwater rope-pull while breathing on a IPHABDS.
- 5) Instruction on Egress with and without IPHABDS.
 - a) Egress video demonstration.
- 6) Egress (Dunker) Practical Application (three events).
 - a) Dunker lowered straight into tank. (Trainees utilize IPHABDS and exit through nearest exit).
 - b) Dunker lowered into tank with a 180-degree roll. (Trainees utilize IPHABDS and exit through nearest exit).

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c) Dunker lowered into tank with a 180-degree roll.
(Trainees are blindfolded and utilize IPHABDS and exit through nearest
exit).

c. Secondary IPHABDS/Egress Training Track. This training track,
as the title suggests, is a secondary means of training Marines and
Sailors when the primary training facilities (Aviation Physiology
Branches, Cherry Point, and Miramar) are unavailable. This training
track will be the primary means for training Marines and Sailors
assigned to III MEF (Okinawa, Japan and Hawaii), due to the lack of
fixed site training facilities at these locations. The trainers will
be those Marines assigned to base training tanks (pools). The
trainers will be trained by the Navy's Aviation Physiology Branches
and will utilize the training equipment and syllabus developed by the
U.S. Navy Aviation Physiology Department as outlined in enclosure 2.
The training standards for IPHABDS and Egress are set forth in
chronological order of execution:

I) The unit leader in-charge of the Marines and Sailors
arriving at the training tank (pool) will provide written
certification from the Unit Commander that all trainees have
successfully achieved the prescribed minimum water survival
standards/qualifications. All trainees will be dressed in the utility
uniform and boots, and equipped with an LPU and IPHABDS for the entire
training evolution.

II) IPHABDS and Egress Instruction and Practical Application.

1) Orientation Brief.

2) Instruction on the IPHABDS.

3) IPHABDS Practical Application.

a) Dry land breathing exercise.

b) Submerged breathing exercise. (Individual sits in
the shallow end of the training tank (pool) and executes procedures
for breathing compressed air from the IPHABDS).

c) 15-yard underwater rope-pull while breathing on a
IPHABDS.

4) Instruction on Egress with and without IPHABDS. (The
apparatus used to simulate an airframe is the Shallow Water Egress
Training (SWET)).

a) Egress video demonstration.

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5) Egress (SWET) Practical Application (four iterations).

a) One iteration of SWET submerged straight down into tank and raised. (Trainees do not utilize IPHABDS and will not Egress from the SWET).

b) One iteration of SWET submerged straight down into tank. (Trainees will have IPHABDS regulator in mouth and will release from the seat and Egress).

c) Two iterations of SWET submerged into tank with a 180-degree roll. (Trainees utilize IPHABDS and release from the seat and Egress).

2. The IPHABDS and Egress training tracks are executable, but have associated operational risk. Additionally, manpower/structure, equipment, and training resource requirements require further analysis to determine viability and cost effectiveness.

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Subj: Core Plus Individual Training Standard task for Egress
from an Aircraft (JUST IN TIME TRAINING)

**TASK: 0300.0?.0? (CORE PLUS) DEMONSTRATE SUBMERGED AIRCRAFT
EGRESS PROCEDURES (Helicopter/Tilt-Rotor/Fixed Wing Aircraft)**

CONDITIONS: As a combat equipped individual being transported in assault support aircraft during a day or night operation, and given a Intermediate Passenger Helicopter Aircrew Breathing Device System (IPHABDS), Personal Floatation Device (PFD), and a constructed emergency situation were the aircraft has ditching in water.

STANDARDS: Efficiently and rapidly exit the aircraft and prepare for rescue on the surface, per the reference(s).

PERFORMANCE STEPS:

1. Inspect Personal Floatation Device (PFD) and Intermediate Passenger Helicopter Aircrew Breathing Device System (IPHABDS) for serviceability.
2. Don and secure PFD under combat equipment.
3. Don combat load (helmet, flak vest, weapon, load bearing equipment) and adjust fit.
4. Load aircraft when directed, and buckle restraint harness/seat belt.
5. Review routes to nearest (primary) exit points, and secondary exits.
6. Visually locate reference points to each exit point.
7. When notified of impending ditching, maintain discipline, remain calm, and pay attention to crew chief's instructions.
8. Lay weapons on the deck and under troop seats time permitting.
8. Assume crash position.
9. Wait for all violent motion and violent water turbulence to stop.
10. Ditch combat load (pack, helmet, flak vest, load bearing equipment, etc.).
11. Place IPHABDS mouthpiece in mouth and breath with control.

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12. Grasp reference point with one hand and release restraint harness/seat belt with other hand. (This will assist with maintaining a starting, reference point and limit/minimize floatation.

13. Pull yourself Hand-Over-Hand from one reference point to another toward nearest exit. DO NOT SWIM.

1) In the darkness of a submerged aircraft, hands will be your eyes.

2) Do not release one reference point until the next reference point has been firmly grasped.

3) To avoid striking personnel behind you, do not kick your feet. Drag legs behind you.

14. Open exit if necessary (window, door, hatch).

15. Grasp exit opening with both hand and pull yourself through.

16. When physically clear of aircraft; inflate your PFD and head/ascend to the surface.

17. During ascent to the surface exhale air from lungs.

18. On the surface, ensure your PFD is fully inflated.

19. On the surface all survivors gather together and prepare for rescue.

REFERENCES: To be Determined (TBD)

1.

2.

ADMINISTRATIVE INSTRUCTIONS:

1. Instructors should stress the importance of remaining calm during any submerged egress situation.

2. Training shall be conducted with combat equipment. Students shall be required to conduct dry run equipment ditching procedures.

3. During this instruction Personal Floatation Device (PFD) with IPHABDS will be non-operational.

INITIAL TRAINING SETTING: Formal Learning Center (FLC) (School House), Sustainment: 12, Req by: Pvt

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TRAINING MATERIEL:

1. Utility uniform
2. Helmet
3. Flak Vest
4. Weapon (Personal and Crew Served)
5. Load Bearing Equipment and Pack
6. Personal Floatation Device (PFD) and/or Personal Floatation Device with an integrated Intermediate Passenger Helicopter Aircrew Breathing Device System (IPHABDS)

AMMUNITION: NA

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Subj: OPERATING FORCE INTERMEDIATE PASSENGER AIRCREW BREATHING DEVICE
SYSTEM (IPHABDS)/Egress Training Employment Plan

EQUIPMENT REQUIREMENTS

1. Two Shallow Water Egress Trainer/Non-Aircrew Marines (SWET/NAM) devices per training site.
2. Two SCUBA tanks with three whips per tank.
3. 50 Intermediate Passenger Helicopter Aircrew Breathing Device System (IPHABDS) bottles per training site.
4. 30 LPU-32 vests with IPHABDS pocket modification per training site.
5. Portable Compressor for bottle refill (if not feasible, a site for bottle refill will need to be identified.

a. Portable compressors will impose additional maintenance requirements.

TRAINING SITES

1. General requirements

- a. No greater than 60-minutes transit time to a recompression facility.
- b. Swimming pool/training tank with shallow section no deeper than 4 feet and large enough to accommodate two SWET/NAM trainers and personnel.
- c. IPHABDS bottle refill station if portable compressors are not available.
- d. Secure storage area.

2. Proposed training sites

- a. Camp Lejeune, NC - Training pool owned by Marine Corps, recompression facility at local 2d Reconnaissance Battalion located at French Creek.
- b. Camp Schwab/Camp Hansen, Okinawa, Japan - Pool facilities owned operated by Morale Welfare and Recreation (MWR) and will need Memorandum of Understanding (MOU) drafted for USMC training usage, recompression unit located with 5th Force Reconnaissance Battalion.
- c. Pearl Harbor, HA - Training pools operated by Navy and will require MOU for USMC training usage, recompression facilities available aboard Pearl Harbor.

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d. Camp Pendelton, CA - Pool facilities To Be Determined (TBD). Recompression facilities TBD.

e. Forward deployed TBD. Once Forward deployed Marine training is completed, the fifth training site will be established for the reserve Marines.

SHALLOW WATER EGRESS TRAINING/NON-AIRCREW MARINES (SWET/NAM)

GENERAL

1. Function. SWET/NAM devices are designed to provide hands-on training in procedures for underwater problem solving and for egress while breathing from the Helicopter Emergency Escape Device (HEEDS) and the IPHABDS, SRU-40/P.

2. Description. The SWET/NAM is used to train students in hand over hand egress techniques and to train non-aircrew personnel in the procedures to be used during egress while using the SRU-40/P. SWET/NAM consists of a tubular frame, a seat, and a shoulder harness/lap belt. For some training, the trainee is strapped into the seat, and then inverted. The student shall use proper egress procedures while using the SRU-40/P.

3. Minimum Personnel Requirements. A minimum of five personnel is required to operate a single training device and perform training. A minimum of two additional personnel is required for each additional training device.

a. Device Positions/Stations for Staff Personnel. The following require device positions/stations shall be staffed during device operations:

1) Supervising Instructor

2) Primary Instructor

3) Device Operator

4) Diving Supervisor

5) Diving Medical Technician (DMT) or Emergency Medical Technician (EMT) certified Hospital Corpsman

b. The Diving Supervisor is not required to be in the water and, must directly supervise all in-water and SRU-40/P training.

c. The DMT or EMT certified Hospital Corpsman must be present for all in-water compressed air breathing training and should not be the Primary Instructor or the Device Operator.

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d. The Diving Supervisor may supervise multiple devices simultaneously.

2. Qualifications. All personnel filling the required device positions/stations shall be fully qualified.

a. Supervising Instructor and Primary Instructors must successfully complete the Naval Operational Medicine Institute Train-The-Trainer Course, or equivalent course approved by MCCDC (TECOM). Instructors shall remain current in first-aid and Cardiopulmonary Resuscitation (CPR) qualifications.

1) Prerequisites for NOMI Train-The-Trainer Course.

A) Completion of a group paced basic instructors training course or equivalent training. Personnel qualified as MCIWS or MCITWS satisfy this requirement.

B) Current certification from the American Red Cross or American Heart Association in a course that covers two people CPR.

C) Minimum qualification as a 1st Class Swimmer or Combat Water Survival, First Class (CWS1).

D) Be a certified U.S. Navy Lifeguard, MCITWS, MCIWS or WSQ. The Navy Lifeguard Course can be conducted as part of the Mobile Training Team (MTT) IPHABDS Train-The-Trainer Course.

E) Completion of U.S. Navy Underwater Egress Course (N9) and the Helicopter Emergency Egress Device (HEED) (N7) is recommended but not required.

b. The Diving Supervisor shall be a qualified Navy Diver or Marine Combatant Diver who has been trained on the recognition and treatment of Compressed gas injuries. The Diving Supervisor shall complete, at a minimum, the IPHABDS maintenance portion of the NOMI MTT Train-The-Trainer Course.

c. Device Operators shall complete a SWET/NAM Operator JQR.

d. Diving Medical Technicians, Emergency Medical Technicians certified Corpsman or Equivalent.

3. Responsibilities.

a. Supervising Instructor. The Supervising Instructor is responsible for all phases of daily training. The Supervising Instructor shall observe training and shall have no specific duties except to supervise that training and to perform required tasks during a mishap.

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b. Primary Instructor. The Primary Instructor is directly in charge of device training and shall:

- 1) Ensure that the application phase is performed per the curricula.
- 2) Allow the student to practice the approved procedures to locate and commence breathing on the SRU-40/P.

c. Diving Supervisor. The Diving Supervisor shall be a qualified Navy Diver or Marine Combatant Diver who has been trained in the recognition and treatment of compressed gas injuries. The Diving Supervisor shall:

- 1) Ensure availability and status of recompression facilities prior to commencement of compressed air breathing.
- 2) Ensure that personnel are available to refill SRU-40/P bottles as necessary.
- 3) Ensure that the SRU-40/P bottles are properly disinfected, prior to use.
- 4) Be responsible for the overall safe use of compressed air during all in-water evolutions.
- 5) Assist the Primary Instructor as necessary.
- 6) Be responsible for management of all injuries or suspected injuries that are related to breathing compressed air.
- 7) After students complete training breathing compresses air, monitor each student for at least 10 minutes for signs of an air embolism following last ascent. During this time, students will not participate in vigorous activity or on dynamic training devices.

d. SWET/NAM Device Operator(s). Device Operator(s) shall:

- 1) Inspect the SWET/NAM to ensure that it is in good mechanical condition and that during rotation, the student will not go below 3 ½ feet/42 inches of water measured at mid-thorax.
- 2) Ensure that the student is property strapped into the device and ready before water entry.
- 3) Slowly rotate the student to the inverted position maintaining a firm grip on the rotation bar(s) and remain alert/ready to retract the student if necessary.

e. Diving Medical Technician, EMT certified Corpsman or equivalent. This person shall become the primary care giver during

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any mishap once the patient has been brought to the pool deck and until more qualified medical support arrives.

OPERATING PROCEDURES

1. General. SWET/NAM shall be operated per established and approved USMC curricula.

2. SRU-40/P Training. For training using the SRU-40/P:

a. The student shall be strapped into the seat using lap and shoulder restraints.

b. When the student is ready, the Device Operator(s) shall slowly rotate the device submerging the student.

c. Student will then proceed with the predetermined egress procedures.

d. If the student appears to be having trouble or gives the signal for assistance, the Primary Instructor shall either assist the student out of the device, or signal for the Device Operator to retract the device (the signal for retract is to point the index finger up and move it in a circle).

e. If the student has been assisted or retracted, the Primary Instructor shall ensure that he/she is not experiencing any physical problems prior to submerging them again.

3. Safety. To avoid injuries, the Primary Instructor shall ensure that:

a. Students are briefed prior to training on the Emergency Signals (i.e. waving of either hand or not performing the egress procedures).

b. When breathing compressed air, that the student does not descend below 3 ½ feet/42 inches during training as measured from mid-thorax.

c. The student exhales continuously during ascent.

d. After breathing compressed air, students are monitored for at least 10 minutes by the Diving Supervisor for signs of an air embolism following last ascent.

e. The students do not strike the pool edge or bottom.

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EMERGENCY PROCEDURES

1. Suspected Water Inhalation.

a. The Primary Instructor shall perform a primary survey and administer care as per Navy Lifeguard procedures.

b. The Supervising Instructor shall clear the pool and ensure activation of the Pre-Mishap Plan.

c. The Primary Instructor shall direct team members in the removal of the student from the water.

d. The Diving Medical, or EMT certified Corpsman shall assume control of the patient once they are moved to the pool deck and ensure that the student is treated for water inhalation and administer supplemental oxygen as needed. The Diving Medical Technician, or EMT will remain as the primary care giver until a qualified medical support arrives.

2. Suspected Gas Embolism.

a. The Diving Supervisor shall supervise the removal of the student from the water and conduct a preliminary neurological exam. If an embolism is suspected, the student shall be placed on supplemental oxygen and transported at once to the nearest hyperbaric chamber treatment facility.

b. The Supervising Instructor shall clear the pool and ensure activation of the Pre-Mishap Plan.

c. The Diving Medical Technician, or EMT certified Corpsman or equivalent shall assist the Diving Supervisor with the neurological exam and will perform duties as the primary care giver until qualified medical support arrives.

d. The Diving Supervisor shall remain with the injured student until the possibility of a gas embolism has been ruled out, or the student has been transferred to the hyperbaric chamber.

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LESSON PLAN

COURSE TITLE: Familiarization for non-aircrew Marines.

TERMINAL OBJECTIVE: Perform inspection, clearing and breathing procedures for the Intermediate Passenger Helicopter Aircrew Breathing Device System (IPHABDS) while wearing the LPU-32 floatation with integrated IPHABDS.

ENABLING OBJECTIVES:

1. State/Perform preflight procedures for the SRU-40/P.
2. Describe procedures for utilizing the SRU-40/P.
3. Name the necessary precautions required to prevent injury during ascent while using compressed air.
4. Perform proper procedures for using the SRU-40/P following a simulated aircraft crash at sea.
5. State and perform regulator clearing procedures for the SRU-40/P.

Instructional Support:

1 Classroom instructor
1 Laboratory instructor
Supporting staff in accordance with Training Plan

ALLOTTED LESSON TIME: 1.0 Classroom
2.5 Laboratory

REQUIRED EQUIPMENT:

1. Classroom
 - a. Videocassette player and Monitor.
 - b. Audiovisual - "Intermediate Passenger Helicopter Aircrew Breathing Device System (SRU-40/P)" SAVPIN (TBD DN.
 - c. IPHABDS demonstration bottle.
 - d. LPU-32 demonstration vest.
2. Laboratory
 - a. Two IPHABDS bottles per student.
 - b. Two SCUBA tanks with three whip regulators set up.
 - c. LPU-32 with IPHABDS pocket modification.

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- d. SWET/NAM Device.

INTRODUCTION:

- 1. Establish Contact Display name and lesson topic.

- a. Introduce self, give grade, and current job.
- b. State background, schools, duty stations, etc.
- c. State question and answer policy.
- d. Ask for medical concerns:

1) Has anyone gone to the clinic or hospital in the last 24 hours, and are you taking any medications? (Refer all personnel with affirmative/positive responses to the Diving Medical Technician, EMT certified Corpsman. All questionable cases should be referred to the hospital/branch clinic for physician recommendation).

2) Has anyone taken over-the-counter medications within the last 24 hours?

3) Are there any potentially disqualifying illnesses/conditions for which you are currently being evaluated?

- 2. State Lesson Objectives.

- 3. Establish Readiness.

a. Motivating statements (establish importance and relevance of lesson material using personal experience, anecdote or lessons learned from a recent mishap).

- b. Lesson Overview (Briefly outline material to be covered).

1) Lesson Topic: Intermediate Passenger Helicopter Aircrew Breathing Device System (SRU-40/P) usage for non-aircrew Marines.

- 2) Major Teaching Points:

A) Intermediate Passenger Helicopter Aircrew Breathing Device System (SRU-40/P), Manufactured by U.S. Divers Micro Air System (MAS).

B) Use during underwater egress.

C) Basic underwater Physics and Physiology.

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PRESENTATION

1. Intermediate Passenger Helicopter Aircrew Breathing Device System (SRU-40/P), Manufacture (Show audiovisual, "Helicopter U.S. Divers Micro Air System (MAS) Aircrew Breathing Device (SRU-40/P)").

2. Display SRU-40/P.

a. DESCRIPTION OF IPHABDS:

1) Compact, lightweight, breathing apparatus intended for use during emergency ditching, providing emergency air upon demand to aid in safe egress from a submerged aircraft.

2) Provides a limited amount of compressed air for underwater breathing at depths and durations normally encountered during helicopter egress.

3) Consists of a small aluminum cylinder and a two stage demand type regulator; the first stage is attached to the cylinder and the second stage is connected via a flexible hose.

4) The cylinder is charged to 3000 pounds square inch (psi). The first stage reduces the pressure to approximately 130 psi. The second stage then reduces the 130-psi to ambient pressure. With the air turned on, no air should flow until you inhale, or the purge button is depressed. This feature is why the regulator is referred to as a demand system.

5) The regulator first stage contains the on/off valve, indicator pin, and the pressure gauge.

6) The second stage contains the mouthpiece, the purge button, and the exhaust port.

7) The second stage is attached to the LPU-32 floatation vest via the regulator mouthpiece retainer cup. (Demonstrate/Don LPU-32 vest with IPHABDS installed).

b. Preflight Inspection:

1) The SRU-40/P must be inspected prior to each flight.

2) Care must be taken when storing the LPU-32 with the SRU-40/P's installed to prevent contamination or damage. The SRU-40/P should be stored in the OFF position.

3) Remove the SRU-40/P from the LPU-32 prior to flight and inspect as follows:

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- A) Check entire unit for signs of contamination or damage.
- B) Check hose for cuts, cracks, and overall integrity.
- C) Check first and second stage for integrity cracks, deterioration, and security of attachment of all components.
- D) Check mouthpiece for cracks, security of attachment, and deterioration.
- E) To turn the SRU-40/P on, grasp the first stage in your left hand, with the pressure gauge facing down.
- F) Note that the On/Off indicator pin is in the slot marked off. (Should be stored in the Off Position.)
- G) Grasp the cylinder with your right hand and slowly twist/turn the cylinder counterclockwise until the indicator pin is positioned inside the circular hole marked "On", do not force the cylinder or damage to the indicator pin may result.
- H) No air should flow. If air does flow, tap the purge button once or twice gently. If this does not stop the airflow, the bottle cannot be used for flight and must be replaced.
- I) Check the pressure indicator gauge. The gauge should indicate a full charge with the needle in the GREEN area.
- J) If the needle is in the RED area the unit cannot be used for flight and must be replaced.
- K) Air should flow (a short burst) when the purge button is depressed then stop flowing. Listen to ensure that the air has stopped flowing. If air continues to flow, the unit cannot be used for flight and must be replaced.
- L) Leave the SRU-40/P on for flight.
- M) After inspection, return the unit to the pocket of the floatation vest making sure it remains in the "On" position. (Point out the related parts of the SRU-40/P).

c. Basic Underwater Physics and Physiology

1) Prior to discussing how to use the IPHABDS, it is important that you understand the dynamics of how compressed air can affect the body.

A) A column of air one-inch square extending from the earth's surface to the outer edge of the flexible container atmosphere weighs 14.7 pounds. Draw illustration of a round volume at the

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surface and at a depth of 33-feet to show a difference in pressure and volume.

I) Referred to as one atmosphere of pressure.

II) This force is constantly exerted on our bodies.

B) One atmosphere of pressure is also represented by a one-inch square column of seawater at a depth of 33-feet.

C) While submerged; the body is subject to not only the pressure of the water, but also the pressure of the air above the water.

I) When at a depth of 33-feet of seawater (FSW), the pressure equals two (2) atmospheres (or 29.4 psi).

II) As depth increases, pressure exerted upon the body will increase by one atmosphere for every 33 FSW.

D) Increased depth and pressure markedly affects the air spaces in the body.

I) The density of air increases linearly with depth.

AA) At 33 FSW the lung will hold twice as much air and have twice as much pressure inside as when at the surface.

BB) At 66 FSW, three times as much, etc.

II) While ascending, the decreasing pressure of the water on the body will result in expansion of the gasses in the lung.

III) If the expanding air inside the lung is not allowed to escape, the lung will rupture causing any one of several over-expansion injuries, the most serious of which is air embolism.

d. Use during underwater Egress

1) Delay between water impact and aircraft submerging.

A) After water impact, (emphasis AFTER impact) retrieve mouth piece from regulator and place it in your mouth. Do not breath from the SRU-40/P until you are underwater.

B) After you are underwater breath in through your mouth and out through your mouth and nose.

C) Make normal egress from aircraft. (Discuss the proper NATOPS egress procedures for the MV-22, CH-53, CH-46 and the UH-1N aircraft).

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D) Swim to the surface. DO NOT hold your breath during the ascent.

E) Inflate your LPU by pulling on the beaded handles on the surface.

2) If unable to place regulator in mouth prior to aircraft filling with water.

A) Place the regulator in your mouth, clear the regulator, and start to breath normally.

I) If the regulator is inserted in your mouth underwater, it must be purged prior to inhaling.

II) With the mouthpiece in your mouth, gently press the purge button in, and simultaneously exhale SHARPLY into the regulator. Exhale only about one half of your breath into the regulator. Inhale carefully, then breath normally. (Demonstrate the proper way of purging the regulator - demonstration should be done above water.)

B) Egress through the nearest exit using reference points. (Stress the importance of maintaining reference points throughout the egress evolution.)

C) Once clear of the aircraft, continue breathing normally, swim to the surface and inflate your floatation device by pulling out and down on the beaded handles. (Demonstrate the proper inflation technique for the LPU-32.)

D) In some cases it may be necessary to inflate the life preserver (floatation device) while underwater, such as being disoriented following a night egress. (Stress that, their floatation device shall never be inflated until they are out of the aircraft. Also depending on depth, the individual may have to "help open the floatation device - this should be demonstrated by the instructor.) Buoyant ascents will increase the possibility of an over inflation injuries, therefore it is imperative that you continuously exhale until on the surface.

E) If resistance is experienced during inhalation, you are running out of air.

I) If you run out of air during ascent you must exhale continuously for the remainder of the ascent.

II) Also, if for any reason you cannot continue to breath off the SRU-40/P after once having started breathing, you must exhale continuously to the surface. After surfacing, inflate your life preserver (floatation device) and begin normal sea survival techniques.

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e. Injuries associated with breathing compressed air

1) Air Embolism

A) The most serious of potential complications.

B) Air is forced from the ruptured air sacs into the blood stream.

C) Bubbles may block arteries, reducing or eliminating blood supply to downstream tissues.

I) The consequences depend upon the area or organ where the blockage occurs.

II) The brain is frequently involved and symptoms are usually serious.

III) Symptoms include dizziness, paralysis, or weakness in extremities, large areas of abnormal sensation, blurring of vision, convulsions, or unconsciousness.

VI) First Aid Treatment includes:

aa) Call medical personnel (if possible).

bb) Administer oxygen.

cc) Treat for shock.

dd) Administer CPR if indicated.

VII) Medical Treatment:

aa) Prompt recompression to reduce bubble size and restore blood flow is imperative.

bb) Without recompression, permanent neurologological damage, and even death, may result.

f. Other Injuries. Other injuries normally associated with SCUBA diving such as decompression sickness (bends), oxygen toxicity, and nitrogen narcosis are not possible when using the SRU-40/P since these injuries occur at much greater depths and underwater breathing times than are possible when using the SRU-40/P.

g. Prevention.

1) As previously stated, as you ascend, the water pressure on the outside of the body will decrease while the volume of the air inside your lungs will increase.

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2) If you hold your breath while ascending, your lungs will quickly expand to a point where they will rupture.

A) In laboratory tests, lung tissue has ruptured with the addition of as little as two (2) psi when the tissue was fully stretched (such as inhaling as deeply as possible).

B) A two (2) psi pressure equals approximately four (4) feet of seawater (FSW).

C) Death from over-expansion injuries has occurred in ascents from depths as shallow as eight (8) feet. (Stress that this training is safe and effective.)

D) To avoid the possibility of experiencing pulmonary over-inflation syndrome following a successful underwater egress, remain calm, breath normally on a normal swimming ascent, exhale continuously to the surface, on a buoyant (inflated floatation device) ascent or after running out of air.

I) This training is conducted in shallow water (three and one half feet/42 inches) to ensure your safety. A lung rupture at this depth of water is extremely unlikely.

h. Application:

1) Students shall wear the LPU-32 floatation with IPHABDS pocket installed. Tell students that following the SRU-40/P training they will be held for 10 minutes in a pre-designated area for medical observation.

2) Familiarization.

A) Demonstrate/perform preflight inspection of the SRU-40/P. (Using SCUBA tank with three whip setup in no deeper than four (4) feet of water/48 inches of water.)

B) Practice off the regulator above the water, then slowly submerge and continue breathing underwater. (Using SCUBA tank with three-whip setup no deeper than four (4) feet of water/48 inches of water.)

C) Practice clearing regulator underwater. (Using SCUBA tank with three-whip setup no deeper than four (4) feet of water/48 inches of water.)

D) Practice recovering the regulator with eyes closed, clearing the regulator and breathing. (Using the LPU-32 with IPHABDS mounted and mouth piece loose.)

3) Hand-Over-Hand Egress Technique.

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A) Demonstrate/perform hand-over-hand egress technique. (Instructor should stress the importance of always maintaining a reference point.)

B) Practice hand-over-hand egress techniques. (Students shall negotiate a hand-over-hand underwater egress. Students must cover a 30-foot length underwater without a IPHABDS. The SWET/NAM device may be used with either an underwater extension rod or ladder to complete the distance. Note: the 30-foot distance represents a worst-case scenario and is equivalent to the length of the CH-53E cabin.)

Students must successfully complete the hand-over-hand underwater egress portion of the training prior to continuing to the next phase of the course.

4) SWET/NAM device.

A) One familiarization ride in the SWET/NAM device, (no SRU-40/P). (Student is strapped into the seat and submerged underwater. The student shall give the Primary Instructor a thumbs up to signify no problems and the student will be re-inverted to the surface. If the student is not comfortable with this stage of training additional work must be done with them prior to moving onto the last three (3) rides with the IPHABDS.)

B) One ride with the regulator in the mouth. (The student will place the regulator on their mouth and signal the Primary Instructor, using a thumbs up, that they are ready to be "Dunked". At that time the Primary Instructor will signal the Device Operator to submerge the student. The student will breath off the IPHABDS, release from the seat and egress the SWET/NAM.

C) One ride with the regulator in the stowed position, place the regulator in mouth, clear the regulator, breath, release from the seat and egress the SWET/NAM. (Student will stow the regulator and mouth piece in the attached pocket of the LPU-32 and signal the Primary Instructor, using a thumbs up, that they are ready to be "Dunked". At that time the Primary Instructor will signal the Device Operator to submerge the student.)

D) One ride with the regulator in stowed position with the student wearing black out goggles. Once inverted underwater, remove the regulator, place in mouth, clear the regulator, then release restraint belts, and egress. (Student will stow the regulator and the mouth piece in the attached pocket of the LPU-32 and signal the Primary Instructor, using a thumbs up, that they are ready to be "Dunked". At that time the Primary Instructor will signal the Device Operator to submerge the student.)